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Application No. **09/838,866**	Filing Date **April 20, 2001**	Examiner **Nguyen, Son T.**	Customer No. **30058**	Group Art Unit **3643**

Invention: **Metal Matrix Composite Horseshoe**

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TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No. 01-211

In Re Application Of: **Samuel C. Weaver**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
09/838,866	April 20, 2001	Nguyen, Son T.	30058	3643	

Invention: **Metal Matrix Composite Horseshoe**

COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **May 19, 2004**

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Dated: **July 19, 2004**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Samuel C. Weaver	)	
	)	**METAL MATRIX**
Serial No. 09/838,866	)	**COMPOSITE HORSESHOE**
	)	
Filed: April 20, 2001	)	
	)	
Art Unit: 3643	)	
	)	
Patent Examiner: Nguyen, Son T.	)	
	)	
Our Ref: 01-211	)	
	)	
Customer No. 30058	)	
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July 19, 2004

APPEAL BRIEF

Real Party in Interest

The subject application has been assigned to Dyson US Holdings, Inc. who is the real party in interest.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1 through 16 are currently pending. Claims 1-16 have been rejected. Claims 1-14 are being appealed. It is respectfully requested that Claims 15 and 16 be withdrawn from further consideration.

Status of Amendments

No amendments were filed subsequent to the final rejection that is now being appealed.

Summary of Invention

The subject invention is directed to an improvement in horseshoes, namely – a horseshoe made of a particular metal matrix composite material. (Page 1, lines 4, 5.)[1] The metal matrix composite horseshoe is distinguished from horseshoes that are made of metals and metal alloys in that it is lightweight and, at the same time, provides improved stiffness and cushioning – all as further described in and claimed in the subject application. (Page 1, lines 28, 29.) (Page 2, lines 14, 15 and U.S. Patent No. 5, 573,607 Abstract.) That is, the metal matrix composite horseshoe affords cushioning to the horse, but has sufficient stiffness to retain its shape. (Page 1, lines 28-29; page 2, lines 14, 15 and U.S. Patent No. 5,573,607 Abstract, Col. 1, lines 22-25; Col. 2, lines 15-19.)

The cushioning is due to relatively high vibration damping in the metal matrix composite. (Page 3, lines 16-23; Weaver Decl. ¶¶ 7, 15.) High vibration damping is not a common property

[1] All citations to "Page __, line __" or to "Appl. page __, line __" refer to Application Serial No. 09/838,866.

among all metal matrix composites. (Weaver Decl. ¶¶ 9, 14, 15 and 16.)[2] Indeed, there is no way to reliably predict the degree of vibration damping in a particular metal matrix composite except by testing that specific metal matrix composite. (Weaver Decl. ¶¶ 14, 15 and 16.) Through testing, the Applicant determined that the vibration damping property of the metal matrix composite that is disclosed in the subject application is relatively high in comparison to metals and metal alloys of the type that were used in prior art horseshoes. (Page 3, lines 16-23; Weaver Decl. ¶¶ 15 and 17.)

The metal matrix composite of the horseshoe disclosed in the application is comprised of (1) a metal selected from the group consisting of aluminum, magnesium, titanium, and mixtures thereof; and (2) particles of silicon tetraboride or silicon hexaboride. (Page 2, lines 3-9; page 3, lines 11-15.) The metal matrix composite horseshoe of the subject invention has unexpected and significant properties. (Page 3, lines 16-23; Weaver Decl. ¶ 16.)

As early as 1993, Japanese Patent No. 407076749A and Eom (the primary reference in the Official Action) identified the need for horseshoes that are lighter and that have shock absorption capability. However, the horseshoes in those references attempted to address that need with a horseshoe that was composed of a ductile material. Horseshoes made of ductile materials tend to loose their shape more quickly than the metal matrix composite horseshoe of the present invention. (Page 3, lines 16-23.) The present inventive horseshoe affords not only improved vibration damping, but also stiffness. (Page 3, lines 16-23; page 2, lines 14, 15 and

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[2] Citations to "Weaver Decl. ¶ __" refer to the Declaration of Samuel C. Weaver dated August 21, 2003 and filed in the record of this prosecution.

U.S. Patent No. 5,573,607 Abstract.) Horseshoes in the prior art did not simultaneously afford both properties. (Page 1, lines 14-19.)

Issues

Whether the Official Action shows that Claims 1-16 are unpatentable under 35 U.S.C. §103 as being obvious over Eom in view of Weaver.

Grouping of Claims

The only grounds for rejection of the Claims is under 35 U.S.C. § 103 as being obvious over Eom in view of Weaver. For that ground of rejection, it is respectfully requested that the Board consider Claim 1 in this Appeal.

Argument

With regard to the rejection of the claims under 35 U.S.C. §103 as being obvious over Eom in view of Weaver, the Applicant presents the following contentions and arguments.

A. The Claimed Invention

It was known in the prior art that non-ferrous metal alloy horseshoes are relatively lightweight in comparison to traditional ferrous metal horseshoes. It was also known that some non-ferrous metal alloy horseshoes are ductile so as to provide cushioning to the hoof. However, horseshoes that afforded cushioning because they were ductile also tended to lose their shape. Therefore, there was a need in the prior art for a horseshoe that was not only lightweight, but that

also afforded greater stiffness so that the horseshoe would better retain its shape while still cushioning the hoof. (Appl. page 1, lines 14-19, 20-31; and U.S. Patent No. 5,344,608 to Eom (herein "Eom").)

Claims 1-14 are directed to an improved horseshoe made of metal matrix composite material. The metal matrix composite horseshoe of Claim 1 is comprised of (1) a metal selected from the group consisting of aluminum, magnesium, titanium, and mixtures thereof; and (2) particles of silicon tetraboride, silicon hexaboride and mixtures thereof. (Appl. Claim 1.)

The claimed horseshoe is distinguished from horseshoes that are made of metals and metal alloys. The claimed metal matrix composite horseshoe is preferred because it is lightweight and has high stiffness while it also affords cushioning for the hoof. The cushioning is due to unexpected and significant vibration damping in the metal matrix composite. (Appl. page 3, lines 16-23; Weaver Decl. ¶ 7.) The metal matrix composite horseshoe of the subject invention provides greater stiffness in comparison to metal and metal alloy horseshoes and, at the same time, provides cushioning through vibration damping. That is, the metal matrix composite horseshoe affords cushioning for the horse and also has sufficient stiffness that it retains its shape. (Appl. page 1, lines 28-31; page 2, lines 14, 15 and U.S. Patent No. 5,573,607, Abstract; and Appl. page 3, lines 16-23.)

B. The Patent Office Rejection of Claims 1-16

The Official Action dated November 21, 2003 (herein "the Official Action") rejected Claims 1-16 under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 5,344,608 to Eom et al. (herein "Eom") in view of U.S. Patent No. 5,573,607 to Weaver (herein "the '607 Patent").

In applying Eom and the '607 Patent, the Official Action relied on Eom for disclosure of a metal alloy horseshoe. The Official Action concedes that Eom fails to disclose "silicon boride composition selected from the group consisting of silicon tetraboride, silicon hexaboride and mixtures thereof" as required by the Claims. (Official Action, page 2) To bridge this shortcoming, the Official Action purports to rely on the '607 Patent's disclosure of a metal matrix composite that includes silicon tetraboride and silicon hexaboride. (Official Action, pages 2, 3.) The Official Action contends that Claims 1-16 are made unpatentably obvious by the '607 Patent. The Official Action argues that the '607 Patent suggests the addition of silicon tetraboride or silicon hexaboride to the metal alloy of Eom to make the metal alloy stronger. (Official Action, page 3.)

Curiously, the Official Action does not purport to modify the metal alloy of Eom to form a metal matrix composite as required by the Claims 1-16. On the contrary, the Official Action states that "the [E]xaminer is not trying to replace the metal of Eom with the metal composite as taught by [the '607 Patent]." (Official Action, page 5, emphasis original) The Examiner further explains, "the [E]xaminer is merely relying on Weaver's teaching of silicon boride composition to make a metal material stronger...." (Official Action, page 5) "The [E]xaminer is not replacing the already taught aluminum, magnesium, etc. in Eom et al. with the whole metal matrix composite of [the '607 Patent]." (Official Action, page 6)

The Official Action fails to recognize fundamental differences between metal alloys and metal matrix composites. The Official Action employs those terms interchangeably with no regard for the fact that they are very different materials. For example, although there is nothing

whatsoever in Eom that describes or suggests a metal matrix composite, at one point the Official Action repeatedly refers to "the metal matrix of Eom". (Official Action, pages 3 and 4) Conversely, the Official Action incorrectly attributes to the '607 Patent a teaching to combine silicon boride with a metal to form a metal alloy. (Official Action, page 3.) However, the '607 Patent has no teaching that describes the inclusion of silicon boride in any metal alloy. Rather the '607 Patent describes a metal matrix composite that includes silicon boride. (e.g. '607 Patent, Col. 2, lines 1-33.) It does not teach the use of metal alloys that contain silicon boride upon which the Official Action relies.

On the contrary, the Official Action's purported combination is directly against the teachings of the '607 Patent. The '607 Patent does not suggest the use of a metal or a metal alloy that includes silicone hexaboride. The '607 Patent does not even teach the use of a metal or a metal alloy! The '607 Patent teaches that instead of using a metal or a metal alloy, a metal matrix composite is to be used. ('607 Patent, Col. 1, lines 19-53.)

Even if the Eon and '607 Patent could be properly combined against their own teachings (which they cannot), the claimed invention would not result. Since Eom fails to disclose a metal matrix composite, the addition of silicon hexaboride to Eom as proposed in the Official Action purports to construct a "metal alloy" horseshoe as opposed to a "metal matrix composite" horseshoe. Thus, in combining the cited references, the Official Action fails to reconstruct the claimed invention.

C. Discussion of the Metal Matrix Composites and Metal Alloys

The Official Action's misconstruction of the cited references evidence a failure or refusal to recognize significant differences between *"metals"* and *"metal matrix composites"* and also between *"metal alloys"* and *"metal matrix composites"*. Metal matrix composites are a different class of materials than metals and metal alloys. A metal matrix composite is not an interchangeable substitute for a metal or a metal alloy.

Metal alloys have one or more metallic and/or non-metallic alloying elements that combine with a base or parent metal at the atomic level. In some cases, the alloying elements replace atoms in the parent metal's lattice. In other cases, the alloying elements are included in the parent metal's lattice without occupying the parent metal's lattice sites. (see e.g. The Fabricator.com, The structure of metal", Bob Capudean, April 24, 2003.) (Filed under IDS on August 22, 2003.)

"Metal matrix composite" is not a synonym for "metal alloy". A metal matrix composite is made of two or more types of material, but in a metal matrix composite, the materials do not combine at the atomic level. In the metal matrix composite, one of the materials (called a reinforcing constituent) is added to a host metal. In some cases, the reinforcing constituent is in the form of a fiber while in other cases, the reinforcing constituent is in the form of a particle. The reinforcing constituent changes the properties of the host metal in ways that are not always predictable and that are not generally possible through conventional alloying methods. (An Introduction to Metal Matrix Composites, pages 1-70, Clyne and Withers, Cambridge University Press 1993.) (Filed under IDS on August 22, 2003.)

D. Claims 1-14 are Patentable Over Eom and the '607 Patent

Claim 1 is patentable over U.S. Patent No. 5,344,608 to Eom et al. (herein "Eom") in that, among other reasons, Claim 1 requires:

> "A metal matrix composite horseshoe having improved vibration damping and stiffness, said horseshoe comprising a metal matrix composite that is formed from a molten metal selected from the group consisting of aluminum, magnesium, titanium and mixtures thereof... ."

Nothing in Eom or the '607 Patent, either alone or in combination, teaches that the improved metal matrix composite horseshoe of Claim 1 provides both improved vibration damping and stiffness. (Weaver Decl. ¶ 9.)

Eom would not lead one skilled in the art to attempt to use a metal matrix composite to produce a horseshoe having improved vibration damping and stiffness as required by Claim 1. Nothing in Eom describes or suggests using a metal matrix composite in a horseshoe. Eom discloses the use of an aluminum alloy horseshoe, not a metal matrix composite horseshoe. (Eom, Abstract.) Eom's aluminum alloy horseshoe includes specified amounts of aluminum, silicon, iron, copper, manganese, magnesium, chromium and zinc. (Eom, Col. 1, lines 56-61; Col. 2, lines 7-63) However, Eom fails to suggest the use of any metal matrix composite.

In addition, Eom fails to suggest a horseshoe of any material that has properties of both stiffness and vibration damping. On the contrary, high vibration damping is not expected in aluminum alloys. (Weaver Decl. ¶ 8.) Indeed, Eom actually teaches away from the use of a material having a property of stiffness! Eom teaches the use of an aluminum alloy having

ductility such that it can be more readily fitted to the horse! (Col. 1, lines 7-10, 25-32, 48-51, Col. 3, lines 7-9; and Weaver Decl. ¶ 8.)

The patentable differences of Claim 1 are not somehow made unpatentable by any proper combination of Eom with the '607 Patent. The '607 Patent has no mention that the metal matrix composite affords "vibration damping" in combination with "stiffness". (Weaver Decl. ¶¶ 9 and 14) According to the inventor of the '607 Patent, the disclosure of the '607 Patent would not have caused one skilled in the art to consider the metal matrix composite disclosed therein as useful in making a horseshoe product having properties of both "vibration damping" and "stiffness". (Weaver Decl. ¶ 9, 11, 14, 15, 16, 18 and 19.) At the time that the '607 Patent issued, the high vibration damping property of the metal matrix composite was unknown and unexpected! (Weaver Decl. ¶¶ 14, 15 and 16.) The high vibration damping property of the metal matrix composite only was discovered through the Applicant's testing of that material years after the '607 Patent was issued. (Weaver ¶¶ 14 – 19.)

The Official Action argues that the '607 Patent states that aluminum and magnesium are used in a "wide variety of industries" and that the usefulness of aluminum and magnesium is limited due to "drawbacks" - including low stiffness, high thermal coefficient of expansion, and low strength. (Official Action, page 2; '507, Col. 1, lines 19-25.) The '607 Patent also teaches that "some of the drawbacks have been overcome through the use of metal matrix composites of those metals." ('607 Patent, Col. 1, lines 26-27.) However, there is nothing to suggest that aluminum, magnesium, titanium, or metal matrix composites of those metals would provide high vibration damping in combination with high stiffness. There is no teaching or suggestion in the

'607 Patent that metal matrix composites can be substituted universally wherever aluminum, magnesium or titanium are used or that the particular metal matrix composite therein described somehow would provide an improved horseshoe. (Weaver Decl. ¶ 9.)

Even assuming that Eom could be said to properly suggest the use of metal matrix composite in horseshoes (which it does not), nothing in Eom or the '607 Patent suggests that the aluminum alloy horseshoe as modified according to the Official Action would have both improved stiffness and improved cushioning due to vibration damping. (Weaver Decl. ¶¶ 8, 14 and 15.) On the contrary, the horseshoe that is described in Eom is said to achieve shock absorption and to change its shape because the aluminum alloy therein described is relatively ductile. (Eom, Col. 1, lines 6-32.) In contrast, the metal matrix composite horseshoe of Claim 1 reduces shock through vibration damping while still exhibiting stiffness that tends to better retain the shape of the horseshoe. (Appl. page 2, lines 14, 15 and '607 Patent, Col. 1, lines 22-25 and Col. 2, lines 14-19; Weaver Decl. ¶¶ 15, 16 and 18.) Eom and the '607 Patent do not suggest or describe a horseshoe that is comprised of a metal matrix composite that affords both stiffness and cushioning by vibration damping in accordance with the subject invention.

E. The Patent Office's Combination of the Eom and '107 Patent References is Improper

To support a theory that it would be obvious to use the particular metal matrix composite of Claim 1 in horseshoes having both improved vibration damping and stiffness properties, the Official Action contends that Eom can be properly combined with the '607 Patent. To do this, the Official Action ignores all differences between metal alloys and metal matrix composites.

Instead, the Official Action merely asserts that: (1) it is known from Eom that horseshoes are made from an aluminum alloy; and (2) adding silicon boride that is used in the '607 Patent to the aluminum alloy of Eon will produce the metal matrix composite of Claim 1. (Official Action, pages 2, 3.)

Such a theory does not make Claim 1 unpatentable. As presently amended, Claim 1 is directed to a particular metal matrix composite horseshoe. Neither Eom nor the '607 Patent supports the Official Action's proposed combination. The Official Action cites the '607 Patent stating that silicon hexaboride could be used in the metal alloy horseshoe of Eom. (Official Action, page 3.). This is not at all what the '607 Patent teaches! This is completely contrary to the '607 Patent and only serves to demonstrate the confusion in the Official Action. The '607 Patent teaches that silicon hexaboride can be used in a metal matrix composite (not a metal alloy) to improve the strength of the metal matrix composite. ('607 Patent Col. 1, lines 53-58, Col. 2, lines 14-19; Weaver Decl. ¶ 11.) Nothing in the '607 Patent suggests that elements of the metal matrix should be combined in a metal alloy. (Weaver Decl. ¶¶ 8, 9, 10, 15, 16 and 17.)

What may have been within the knowledge of one skilled in the art is insufficient absent evidence that one of ordinary skill in the art actually possessed such knowledge. Smiths Indus. Med. Sys., Inc., 183 F.3d 1347, 1356 (Fed. Cir. 1999). Neither Eom nor the '607 Patent evidence any known suitability of the metal matrix composite as having properties of both stiffness and vibration damping. (Weaver Decl. ¶¶ 12, 14, and 15.) Consequently, nothing in those references describes or suggests that one attempting to construct a horseshoe having both stiffness and vibration damping had merely to select silicon hexaboride for use in a known

horseshoe composed of a metal alloy. (Weaver Decl. ¶¶ 12, 16, 18, 19 and 20.) In fact, neither Eom nor the '607 Patent suggest the use of a metal matrix composite in horseshoes and neither Eom nor the '607 Patent teach a metal matrix composite having properties of both stiffness and vibration damping as required in Claim 1. (Weaver Decl. ¶¶ 8, 14, 15, 16 and 17.) Therefore, there is no basis for contending that one skilled in the art could refer to Eom and the '607 Patent to produce a metal matrix composite to construct a horseshoe or that using silicon boride in such a metal matrix composite would afford properties of both stiffness and vibration damping in the horseshoe as required by Claim 1. (Weaver Decl. ¶¶ 19 and 20.)

The Official Action engages an impermissible "obvious to try" standard for which the cited references, either alone or in combination, fail to teach all the limitations required by Claim 1. There is no obvious motivation to substitute the metal matrix composite of the '607 Patent for the metal alloy of Eom when that metal alloy itself is intended to modify selected properties of the base aluminum metal.

Indeed, Eom actually teaches away from the use of a metal matrix composite to make horseshoes! A reference does not contain a suggestion to combine references and teaches away from the invention if one of ordinary skill in the art following the line of development disclosed in the reference would not likely produce the Applicant's result. Tec Air, Inc. v. Denso Mfg. Michigan, Inc., 192 F.3d 1353, 1360 (Fed. Cir. 1999). Ecolochem, Inc. v. Southern California Edison Co., 227 F.3d 1361 (Fed. Cir. 2000), reh'g denied, in banc suggestion declined, (December 13, 2000) and cert. denied, 121 S. Ct. 1607 (2001). (Secondary reference recommended alternative method to that of primary references.)

Following the teachings of Eom, one normally skilled in the art would be led to use an aluminum alloy as opposed to the metal matrix composite as required by Claim 1. (Weaver Decl. ¶¶ 8, 9, 10 and 11.) In fact, that is exactly what the Official Action has proposed! Therefore, the combination of references as proposed by the Official Action is improper.

The combination of the '607 Patent and Eom as proposed by the Official Action is necessarily based on the Applicant's own teachings and not the teachings of the references. Claim 1 is not made unpatentable by combining Eom and the '607 Patent in accordance with the Applicant's own teachings. A determination of obviousness must involve more than indiscriminately combining prior art. Micro Chem., Inc. v. Great Plains Chem. Co., Inc., 103 F.3d 1538, 1546 (Fed. Cir. 1997), cert. denied, 117 S. Ct. 2516 (1997). The Patent Office must show a motivation to combine references to prevent the use of the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. In re Rouffet, 149 F. 3d 1350 (Fed. Cir. 1998)(reversing the Patent Office Board of Appeals holding of obviousness). The requirement of a motivation to combine references is necessary to prevent findings of obviousness based improperly on "the subtle but powerful attraction" of hindsight reconstruction. Ruiz v. A.B. Chance Co., 234 F. 3d 654, 664-65 (Fed. Cir. 2000). Absent any disclosure or suggestion of an element or step that the cited references have failed to disclose, there can be no motivation to modify the prior art to arrive at the claimed invention. In re Kotzab, 217 F. 3d 1365, 1370 (Fed. Cir. 2000)(reversing the Patent Office Board of Appeals and Interferences' affirmance of the Patent Office rejection of an application based on a combination of references).

Neither Eom nor the '607 Patent teaches that the metal matrix composite horseshoe has both stiffness and cushioning due to high vibration damping. The Official Action concedes that Eom does not teach the use of silicon boride composition. (Official Action, pages 2, 3.) The '607 Patent does not teach that a metal matrix composite having silicon boride will demonstrate properties of both stiffness and cushioning due to high vibration damping. (Weaver Decl. ¶¶ 12, 13, 14.) The Official Action's bare assertions of "ordinary skill in the art" cannot bridge that gap. Missing suggestions cannot be supplied merely by reference to "ordinary skill in the art." Imbuing one of ordinary skill in the art with the knowledge of the invention at issue in the absence of art that conveys or suggests such knowledge is to fall victim to hindsight reconstruction. Al-Site Corp. v. VSI Int'l, Inc., 174 F.3d 1308 (Fed. Cir. 1999). The best tool in preventing impermissible hindsight reconstruction is the rigorous application of the requirement for a showing of a teaching or motivation to combine prior art references. In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999) (reversing the Board of Patent Appeals and Interferences affirmation of the Patent Office obviousness rejections).

There is no suggestion in Eom or the '607 Patent as to why one skilled in the art would be led by a reference (Eom) that teaches the use of metal alloys in horseshoes to attempt to use an element from a metal matrix composite that is not known to have cushioning properties (the '607 Patent) to make a metal matrix composite horseshoe that has both stiffness and cushioning. Claim 1, therefore, is patentable over those references.

F. The Patent Office's Combination of References Does Not Result in the Claimed Invention

The rejection of Claims 1-14 ignores or confuses the important differences between metal matrix composites and metal alloys. The Official Action argues that it would be obvious to borrow an element from the metal matrix composite of Weaver and substitute it in the metal alloy of Eom. (Official Action, pages 2, 3.) There is absolutely nothing in either Eom or the '607 Patent to support such a conclusion. Even if, in the absence of any teachings in the references, it were correct to make such a combination (which it is not), that combination fails to accurately reconstruct the claimed invention.

Combining the references as the Official Action proposes produces a metal alloy horseshoe. However, none of Claims 1-14 claim a "metal alloy" horseshoe. The claimed invention is directed to a "metal matrix composite" horseshoe. The combination proposed by the Official Action would not produce any metal matrix composite product because Eom says nothing about a metal matrix composite! By refusing to recognize the differences between metal matrix composites and metal alloys, the Official Action cannot transform what is non-obvious into something that is obvious.

Eom teaches nothing about stiffness. To overcome this deficiency, the Official Action attempts to confuse "stiffness" with "abrasion resistance." The Official Action declares: "Eom et al. teach (sic) a horseshoe that has stiffness and vibration damping (see Col. 1, lines 7-10, 64-68 and Col. 2, lines 1-6, "abrasion resistance" would be for "stiffness" because if not stiff, abrasion would occur; ...)" (Official Action, page 6, lines 3-6.) The Official Action asserts "if the horseshoe is not stiff, then it will abrade easily." (Official Action, page 6.) The Official Action also states, "Eom et al. stress an interest in abrasion resistance and shock absorption, which are

basically the same as vibration damping and stiffness because if the horseshoe is not stiff, then it will abrade easily." (Official Action, page 6)

This assertion is nonsensical and there is absolutely nothing in either Eom or the '607 Patent to support it. "Abrasion resistance" is not at all the same as "stiffness". The Official Action does not cite any authority for this erroneous equation between "abrasion resistance" and "stiffness." It is simply wrong. Abrasion resistance refers to the resistance of a material to abrasion – that is removal of the material by tangential frictional forces. (Eom, Col. 1, lines 64-68.) Stiffness (relating to the modulus of elasticity), means that it retains its shape. (Appl. page 2, lines 14, 15 and '607 Patent, Col. 1, lines 22-26, Col. 2, lines 14-19, Abstract.)

To overcome the inherent gaps between the invention of Claims 1-14 and the cited references, the Official Action also contends that the '607 Patent teaches that silicon boride could be added to aluminum "to make a metal material stronger". (Official Action, pages 3 and 5) However, Claims 1-14 do not require a metal matrix composite horseshoe that is stronger. Rather, the claimed metal matrix composite horseshoe requires "vibration damping" in combination with "stiffness." That is not described in the references.

G. The Claimed Invention Offers Unexpected and Significant Advantages Over Prior Art Horseshoes

The high vibration damping of the metal matrix composition of Claim 1 evidences patentability of Claim 1. A property not possessed by the prior art evidences nonobviousness. In re. Papesch, 315 F.2d 381, 137USPQ 43 (CCPA 19063).

The high vibration damping property of the claimed metal matrix composite horseshoe was unexpected because high vibration damping is not a common property for all metal matrix

composites. (Appl. page 3, lines 20-23) Weaver Decl. ¶¶ 9, 15 and 16.) Indeed, there is no way to reliably predict whether a metal matrix composite will have high vibration damping. The degree of vibration damping for a metal matrix composite is learned only by testing the specific metal matrix composite. (Weaver Decl. ¶¶ 14, 15 and 16.) The ductility of a metal alloy is not a predictor that a metal matrix composite article that includes some of the same elements as the metal alloy necessarily will exhibit high vibration damping. The high vibration damping property of the metal matrix composite horseshoe that is disclosed in the subject application and claimed in Claim 1 was discovered through testing. (Weaver Decl. ¶¶ 15 and 17.)

The high vibration damping property of the metal matrix composite horseshoe is not only unexpected, but also significant. The need for lighter horseshoes that had shock absorption capability was identified at least as early as 1993[3]. Prior horseshoes attempted to address that need with a horseshoe composed of a ductile material. (Eom, Col. 1.) However, those prior art horseshoes tended to loose their shape. (Eom, Col. 1, lines 27-31; Eom, Col. 2, lines 3-6.) The high vibration damping property of the claimed metal matrix composite horseshoe was especially significant because the metal matrix material also has high stiffness so that the horseshoe retains its shape.

H. Claims 2-14

Claim 9 is directed to a metal matrix composite horseshoe having "stiffness" and "vibration damping" and specifies "molten aluminum metal" for forming the metal matrix composite. Accordingly, Claim 9 is patentable over Eom and the '607 Patent for the same

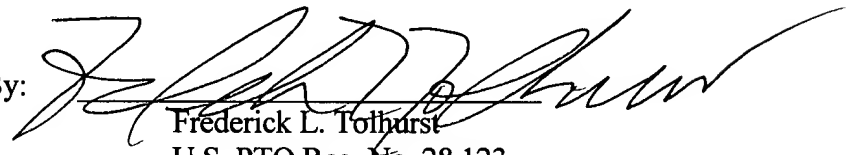
[3] Japanese Patent No. 407076749A and Eom.

reasons discussed with respect to Claim 1. Claims 2-8 and 10-14 are dependent on Claims 1 and 9 respectively and incorporate the structure of Claims 1 and 9. Therefore, Claims 2-8 and 10-14 are also patentable over the prior art for the same reasons stated with respect to Claim 1. It has been requested that Claims 15 and 16 be withdrawn from this Appeal.

I. Conclusion

In the Official Action dated November 21, 2003, the Examiner made the rejection of Claims 1-16 final. The Official Action relies solely on U.S. Patent No. 5,344,608 to Eom and U.S. Patent No. 5,573,607 to Weaver. No other references are cited or relied on. Applicant has demonstrated that that rejection is unsupported by the record of this application, the statutes on which such rejection is purportedly based, and controlling decisional authority. Accordingly, allowance of Claims 1-14 is hereby respectfully requested.

Respectfully submitted,

By: 

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Appendix

The following claims are the claims on appeal as presently amended:

1. (previously presented) A metal matrix composite horseshoe having improved vibration damping and stiffness, said horseshoe comprising a metal matrix composite that is formed from a molten metal selected from the group consisting of aluminum, magnesium, titanium and mixtures thereof, and from particles of silicon boride composition selected from the group consisting of silicon tetraboride, silicon hexaboride and mixtures thereof, said silicon boride composition being present in a range from about 0.1 to about 80 weight percent in said molten metal.

2. (original) A horseshoe in accordance with claim 1 wherein said silicon boride composition is silicon hexaboride.

3. (original) A horseshoe in accordance with claim 2 wherein said silicon hexaboride has an average particle size of about 0.1 to about 200 micrometers.

4. (original) A horseshoe in accordance with claim 3 wherein said silicon hexaboride has an average particle size of about 20 micrometers.

5. (original) A horseshoe in accordance with claim 1 wherein said molten metal is aluminum.

6. (original) A horseshoe in accordance with claim 4 wherein said molten metal is aluminum.

7. (original) A horseshoe in accordance with claim 1 wherein said silicon boride composition is present in a range from about 10 to about 45 weight percent.

8. (original) A horseshoe in accordance with claim 3 wherein said silicon hexaboride is present in a range from about 10 to about 45 weight percent.

9. (previously presented) A metal matrix composite horseshoe having improved vibration damping and stiffness, said horseshoe comprising a metal matrix composite that is formed from molten aluminum metal and from particles of silicon boride composition selected from the group consisting of silicon tetraboride, silicon hexaboride and mixtures thereof, said silicon boride composition being present in a range from about 0.1 to about 80 weight percent in said molten aluminum metal.

10. (original) A horseshoe in accordance with claim 9 wherein said silicon boride composition is silicon hexaboride.

11. (original) A horseshoe in accordance with claim 10 wherein said silicon hexaboride has an average particle size of about 0.1 to about 200 micrometers.

12. (original) A horseshoe in accordance with claim 10 wherein said silicon hexaboride has an average particle size of about 20 micrometers.

13. (original) A horseshoe in accordance with claim 9 wherein said silicon boride composition is present in a range from about 10 to about 45 weight percent.

14. (original) A horseshoe in accordance with claim 10 wherein said silicon hexaboride is present in a range from about 10 to about 45 weight percent.

15. (withdrawn) A horseshoe comprising a metal matrix composite, said metal matrix composite being formed from molten aluminum metal and particles of silicon hexaboride particles having an average particle of 20 micrometers and being present in a range from bout 0.1 to about 80 weight percent in said molten aluminum metal.

16. (withdrawn) A horseshoe in accordance with claim 15 wherein said silicon hexaboride is present in a range from about 10 to about 45 weight percent in the molten aluminum metal.